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SESSION IV: WHEAT DISEASE

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***Exploring plant susceptibility genes in pest management.***

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Plants are under constant attack from various pathogens and other types of herbivores. To survive these attacks, plants have evolved layers of defense mechanisms. During the long course of co-evolution, many plant insects and pathogens have gained the ability to suppress plant defense and alter plant metabolic pathways. A typical example is the Hessian fly (*Mayetiola destructor*), one of the most destructive pests of wheat worldwide. In order to survive on wheat, Hessian fly larvae need to suppress wheat basal defense, induce the formation of nutritive cells that act as a nutrient sink, and inhibit wheat growth. Recently, we have identified a gene in wheat that is required for Hessian fly to manipulate wheat seedlings. Because it is essential for wheat susceptibility to Hessian fly attacks, we named this gene *Mayetiola destructor susceptibility gene-1 (Mds-1)*. Knockdown of *Mds-1* can prevent Hessian fly from successful manipulation of wheat seedlings. As a result, plants that are normally susceptible to Hessian fly attack become resistant. On the other hand, elevated expression of *Mds-1* artificially make wheat seedlings, that are normally resistant due to the presence of a major R gene, susceptible. The essentiality of *Mds-1* for wheat seedlings to Hessian fly attacks provides us an opportunity to use it as a target for Hessian fly management.

***Integrating genetic resistance and fungicides for Fusarium head blight management.***

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Fusarium head blight (FHB) continues to be a serious problem in many wheat-producing regions of the North America. In recent years, portions of Kansas and Nebraska have experience significant yield losses from this disease. The breeding programs within the hard winter wheat production region have been actively pursuing genetic resistance to FHB for nearly a decade. These efforts have resulted in the release of several varieties with elevated resistance to the disease. The current challenge now is to demonstrate the value of these new varieties as part of an integrated approach to reducing the risk of the severe yield loss and deoxynivalenol contamination resulting from FHB. Multi-state research projects are underway to evaluate the potential of value of combining genetic resistance with crop rotation and fungicide application. The results of these trials indicate that genetic resistance to FHB is most important factor influencing disease intensity, but that crop rotation and fungicides can also be used effectively to reduce the risk of yield loss and DON contamination. A disease forecasting system that provides daily estimates of disease risk also is available to help producers evaluate the need for timely fungicide applications. Additional research is needed to evaluate the potential variations of this integrated approach that will maximize the value of each tool to the producer.